Sequence Listing

<110> MEDEXGEN Inc.
CHUNG, Yong-Hoon
LEE, Hak-sup
YI, Ki-Wan
HEO, Youn-Hwa
KIM, Jae-Youn

<120> A method of improving efficacy of biological response-modifying proteins and the exemplary muteins

<150> KR10-2003-0051846
<151> 2003-07-26

<160> 65

<170> KopatentIn 1.71

<210> 1
<211> 200
<212> PRT
<213> Artificial Sequence

<220>
<223> CNTF: 3rd, 83rd, 98th, 105th, 119th, 152nd or 178th Phe is replaced by Val.

<400> 1

Met Ala Phe Thr Glu His Ser Pro Leu Thr Pro His Arg Arg Asp Leu
1 5 10 15

Cys Ser Arg Ser Ile Trp Leu Ala Arg Lys Ile Arg Ser Asp Leu Thr
20 25 30

Ala Leu Thr Glu Ser Tyr Val Lys His Gln Gly Leu Asn Lys Asn Ile
35 40 45

Asn Leu Asp Ser Ala Asp Gly Met Pro Val Ala Ser Thr Asp Gln Trp
50 55 60

Sequence Listing

```
Ser Glu Leu Thr Glu Ala Glu Arg Leu Gln Glu Asn Leu Gln Ala Tyr
 65                  70                  75                  80

Arg Thr Phe His Val Leu Leu Ala Arg Leu Leu Glu Asp Gln Gln Val
                 85                  90                  95

His Phe Thr Pro Thr Glu Gly Asp Phe His Gln Ala Ile His Thr Leu
            100                 105                 110

Leu Leu Gln Val Ala Ala Phe Ala Tyr Gln Ile Glu Glu Leu Met Ile
        115                 120                 125

Leu Leu Glu Tyr Lys Ile Pro Arg Asn Glu Ala Asp Gly Met Pro Ile
    130                 135                 140

Asn Val Gly Asp Gly Gly Leu Phe Glu Lys Lys Leu Trp Gly Leu Lys
145                 150                 155                 160

Val Leu Gln Glu Leu Ser Gln Trp Thr Val Arg Ser Ile His Asp Leu
                165                 170                 175

Arg Phe Ile Ser Ser His Gln Thr Gly Ile Pro Ala Arg Gly Ser His
            180                 185                 190

Tyr Ile Ala Asn Asn Lys Lys Met
        195                 200
```

<210> 2
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> EPO: 48th, 138th, 142nd or 148th Phe is replcaced by Val.

<400> 2

```
Ala Pro Pro Arg Leu Ile Cys Asp Ser Arg Val Leu Glu Arg Tyr Leu
  1               5                  10                  15
```

Sequence Listing

```
Leu Glu Ala Lys Glu Ala Glu Asn Ile Thr Thr Gly Cys Ala Glu His
            20                  25                  30

Cys Ser Leu Asn Glu Asn Ile Thr Val Pro Asp Thr Lys Val Asn Phe
        35                  40                  45

Tyr Ala Trp Lys Arg Met Glu Val Gly Gln Gln Ala Val Glu Val Trp
    50                  55                  60

Gln Gly Leu Ala Leu Leu Ser Glu Ala Val Leu Arg Gly Gln Ala Leu
65                  70                  75                  80

Leu Val Asn Ser Ser Gln Pro Trp Glu Pro Leu Gln Leu His Val Asp
                85                  90                  95

Lys Ala Val Ser Gly Leu Arg Ser Leu Thr Thr Leu Leu Arg Ala Leu
            100                 105                 110

Arg Ala Gln Lys Glu Ala Ile Ser Pro Pro Asp Ala Ala Ser Ala Ala
        115                 120                 125

Pro Leu Arg Thr Ile Thr Ala Asp Thr Phe Arg Lys Leu Phe Arg Val
    130                 135                 140

Tyr Ser Asn Phe Leu Arg Gly Lys Leu Lys Leu Tyr Thr Gly Glu Ala
145                 150                 155                 160

Cys Arg Thr Gly Asp Arg
                165
```

<210> 3
<211> 209
<212> PRT
<213> Artificial Sequence

<220>
<223> Flt3L: 6th, 15th, 81st, 87th, 96th or 124th Phe is replaced by Val.

Sequence Listing

<400> 3

```
Thr Gln Asp Cys Ser Phe Gln His Ser Pro Ile Ser Ser Asp Phe Ala
  1               5                  10                  15

Val Lys Ile Arg Glu Leu Ser Asp Tyr Leu Leu Gln Asp Tyr Pro Val
             20                  25                  30

Thr Val Ala Ser Asn Leu Gln Asp Glu Glu Leu Cys Gly Gly Leu Trp
         35                  40                  45

Arg Leu Val Leu Ala Gln Arg Trp Met Glu Arg Leu Lys Thr Val Ala
     50                  55                  60

Gly Ser Lys Met Gln Gly Leu Leu Glu Arg Val Asn Thr Glu Ile His
 65                  70                  75                  80

Phe Val Thr Lys Cys Ala Phe Gln Pro Pro Pro Ser Cys Leu Arg Phe
                 85                  90                  95

Val Gln Thr Asn Ile Ser Arg Leu Leu Gln Glu Thr Ser Glu Gln Leu
            100                 105                 110

Val Ala Leu Lys Pro Trp Ile Thr Arg Gln Asn Phe Ser Arg Cys Leu
        115                 120                 125

Glu Leu Gln Cys Gln Pro Asp Ser Ser Thr Leu Pro Pro Pro Trp Ser
    130                 135                 140

Pro Arg Pro Leu Glu Ala Thr Ala Pro Thr Ala Pro Gln Pro Pro Leu
145                 150                 155                 160

Leu Leu Leu Leu Leu Leu Pro Val Gly Leu Leu Leu Ala Ala Ala
                165                 170                 175

Trp Cys Leu His Trp Gln Arg Thr Arg Arg Arg Thr Pro Arg Pro Gly
            180                 185                 190

Glu Gln Val Pro Pro Val Pro Ser Pro Gln Asp Leu Leu Leu Val Glu
```

195 200 205

His

<210> 4
<211> 174
<212> PRT
<213> Artificial Sequence

<220>
<223> G-CSF: 13rd, 83rd, 113rd, 140th, 144th or 160th Phe is replaced by Val.

<400> 4

```
Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys
 1               5                  10                  15

Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln
            20                  25                  30

Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val
        35                  40                  45

Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys
    50                  55                  60

Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser
65                  70                  75                  80

Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser
                85                  90                  95

Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp
            100                 105                 110

Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro
        115                 120                 125
```

Sequence Listing

Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe
130 135 140

Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe
145 150 155 160

Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
165 170

<210> 5
<211> 127
<212> PRT
<213> Artificial Sequence

<220>
<223> GM-CSF: 47th, 103rd, 106th, 113rd or 119th Phe is replaced by Val.

<400> 5
Ala Pro Ala Arg Ser Pro Ser Pro Ser Thr Gln Pro Trp Glu His Val
1 5 10 15

Asn Ala Ile Gln Glu Ala Arg Arg Leu Leu Asn Leu Ser Arg Asp Thr
20 25 30

Ala Ala Glu Met Asn Glu Thr Val Glu Val Ile Ser Glu Met Phe Asp
35 40 45

Leu Gln Glu Pro Thr Cys Leu Gln Thr Arg Leu Glu Leu Tyr Lys Gln
50 55 60

Gly Leu Arg Gly Ser Leu Thr Lys Leu Lys Gly Pro Leu Thr Met Met
65 70 75 80

Ala Ser His Tyr Lys Gln His Cys Pro Pro Thr Pro Glu Thr Ser Cys
85 90 95

Sequence Listing

Ala Thr Gln Ile Ile Thr Phe Glu Ser Phe Lys Glu Asn Leu Lys Asp
100 105 110

Phe Leu Leu Val Ile Pro Phe Asp Cys Trp Glu Pro Val Gln Glu
115 120 125

<210> 6
<211> 191
<212> PRT
<213> Artificial Sequence

<220>
<223> GH: 1st, 10th, 25th, 31st, 44th, 54th, 92th, 97th, 139th, 146th, 166th, 176th or 191st Phe is replaced by Val.

<400> 6
Phe Pro Thr Ile Pro Leu Ser Arg Leu Phe Asp Asn Ala Met Leu Arg
1 5 10 15

Ala His Arg Leu His Gln Leu Ala Phe Asp Thr Tyr Gln Glu Phe Glu
20 25 30

Glu Ala Tyr Ile Pro Lys Glu Gln Lys Tyr Ser Phe Leu Gln Asn Pro
35 40 45

Gln Thr Ser Leu Cys Phe Ser Glu Ser Ile Pro Thr Pro Ser Asn Arg
50 55 60

Glu Glu Thr Gln Gln Lys Ser Asn Leu Glu Leu Leu Arg Ile Ser Leu
65 70 75 80

Leu Leu Ile Gln Ser Trp Leu Glu Pro Val Gln Phe Leu Arg Ser Val
85 90 95

Phe Ala Asn Ser Leu Val Tyr Gly Ala Ser Asp Ser Asn Val Tyr Asp
100 105 110

Sequence Listing

```
Leu Leu Lys Asp Leu Glu Glu Gly Ile Gln Thr Leu Met Gly Arg Leu
        115                 120                 125

Glu Asp Gly Ser Pro Arg Thr Gly Gln Ile Phe Lys Gln Thr Tyr Ser
    130                 135                 140

Lys Phe Asp Thr Asn Ser His Asn Asp Asp Ala Leu Leu Lys Asn Tyr
145                 150                 155                 160

Gly Leu Leu Tyr Cys Phe Arg Lys Asp Met Asp Lys Val Glu Thr Phe
                165                 170                 175

Leu Arg Ile Val Gln Cys Arg Ser Val Glu Gly Ser Cys Gly Phe
            180                 185                 190
```

<210> 7
<211> 165
<212> PRT
<213> Artificial Sequence

<220>
<223> IFN-alpha 2A: 27th, 36th, 38th, 43rd, 47th, 64th, 67th, 84th, 123rd or 151st Phe is replaced by Val.

<400> 7

```
Cys Asp Leu Pro Gln Thr His Ser Leu Gly Ser Arg Arg Thr Leu Met
  1               5                  10                  15

Leu Leu Ala Gln Met Arg Lys Ile Ser Leu Phe Ser Cys Leu Lys Asp
            20                  25                  30

Arg His Asp Phe Gly Phe Pro Gln Glu Glu Phe Gly Asn Gln Phe Gln
        35                  40                  45

Lys Ala Glu Thr Ile Pro Val Leu His Glu Met Ile Gln Gln Ile Phe
```

```
     50                  55                  60

Asn Leu Phe Ser Thr Lys Asp Ser Ser Ala Ala Trp Asp Glu Thr Leu
 65                  70                  75                  80

Leu Asp Lys Phe Tyr Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu Glu
                 85                  90                  95

Ala Cys Val Ile Gln Gly Val Gly Val Thr Glu Thr Pro Leu Met Lys
            100                 105                 110

Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr Leu
        115                 120                 125

Tyr Leu Lys Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val Arg
    130                 135                 140

Ala Glu Ile Met Arg Ser Phe Ser Leu Ser Thr Asn Leu Gln Glu Ser
145                 150                 155                 160

Leu Arg Ser Lys Glu
                165
```

<210> 8
<211> 165
<212> PRT
<213> Artificial Sequence

<220>
<223> IFN-alpha 2B: 27th, 36th, 38th, 43rd, 47th, 64th, 67th, 84th, 123rd or 151st Phe is replaced by Val.

<400> 8

```
Cys Asp Leu Pro Gln Thr His Ser Leu Gly Ser Arg Arg Thr Leu Met
  1               5                  10                  15

Leu Leu Ala Gln Met Arg Arg Ile Ser Leu Phe Ser Cys Leu Lys Asp
             20                  25                  30
```

Sequence Listing

```
Arg His Asp Phe Gly Phe Pro Gln Glu Glu Phe Gly Asn Gln Phe Gln
         35                  40                  45

Lys Ala Glu Thr Ile Pro Val Leu His Glu Met Ile Gln Gln Ile Phe
     50                  55                  60

Asn Leu Phe Ser Thr Lys Asp Ser Ser Ala Ala Trp Asp Glu Thr Leu
 65                  70                  75                  80

Leu Asp Lys Phe Tyr Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu Glu
                 85                  90                  95

Ala Cys Val Ile Gln Gly Val Gly Val Thr Glu Thr Pro Leu Met Lys
            100                 105                 110

Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr Leu
        115                 120                 125

Tyr Leu Lys Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val Arg
    130                 135                 140

Ala Glu Ile Met Arg Ser Phe Ser Leu Ser Thr Asn Leu Gln Glu Ser
145                 150                 155                 160

Leu Arg Ser Lys Glu
                165
```

<210> 9
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> IFN-Beta: 8th, 38th, 50th, 67th, 70th, 111st or 154th Phe is replaced by Val.

<400> 9

Sequence Listing

```
Met Ser Tyr Asn Leu Leu Gly Phe Leu Gln Arg Ser Ser Asn Cys Gln
 1               5                  10                  15

Cys Gln Lys Leu Leu Trp Gln Leu Asn Gly Arg Leu Glu Tyr Cys Leu
            20                  25                  30

Lys Asp Arg Arg Asn Phe Asp Ile Pro Glu Glu Ile Lys Gln Leu Gln
        35                  40                  45

Gln Phe Gln Lys Glu Asp Ala Ala Val Thr Ile Tyr Glu Met Leu Gln
    50                  55                  60

Asn Ile Phe Ala Ile Phe Arg Gln Asp Ser Ser Ser Thr Gly Trp Asn
65                  70                  75                  80

Glu Thr Ile Val Glu Asn Leu Leu Ala Asn Val Tyr His Gln Arg Asn
                85                  90                  95

His Leu Lys Thr Val Leu Glu Glu Lys Leu Glu Lys Glu Asp Phe Thr
            100                 105                 110

Arg Gly Lys Arg Met Ser Ser Leu His Leu Lys Arg Tyr Tyr Gly Arg
        115                 120                 125

Ile Leu His Tyr Leu Lys Ala Lys Glu Asp Ser His Cys Ala Trp Thr
    130                 135                 140

Ile Val Arg Val Glu Ile Leu Arg Asn Phe Tyr Val Ile Asn Arg Leu
145                 150                 155                 160

Thr Gly Tyr Leu Arg Asn
                165
```

<210> 10
<211> 146
<212> PRT
<213> Artificial Sequence

<220>

Sequence Listing

<223> IFN-gamma: 18th, 32nd, 55th, 57th, 60th, 63rd, 84th, 85th, 95th or 139th Phe is replaced by Val.

<400> 10

```
Cys Tyr Cys Gln Asp Pro Tyr Val Lys Glu Ala Glu Asn Leu Lys Lys
 1               5                  10                  15

Tyr Phe Asn Ala Gly His Ser Asp Val Ala Asp Asn Gly Thr Leu Phe
            20                  25                  30

Leu Gly Ile Leu Lys Asn Trp Lys Glu Glu Ser Asp Arg Lys Ile Met
        35                  40                  45

Gln Ser Gln Ile Val Ser Phe Tyr Phe Lys Leu Phe Lys Asn Phe Lys
    50                  55                  60

Asp Asp Gln Ser Ile Gln Lys Ser Val Glu Thr Ile Lys Glu Asp Met
65                  70                  75                  80

Asn Val Lys Phe Phe Asn Ser Asn Lys Lys Lys Arg Asp Asp Phe Glu
                85                  90                  95

Lys Leu Thr Asn Tyr Ser Val Thr Asp Leu Asn Val Gln Arg Lys Ala
            100                 105                 110

Ile His Glu Leu Ile Gln Val Met Ala Glu Leu Ser Pro Ala Ala Lys
        115                 120                 125

Thr Gly Lys Arg Lys Arg Ser Gln Met Leu Phe Gln Gly Arg Arg Ala
    130                 135                 140

Ser Gln
145
```

<210> 11
<211> 172
<212> PRT
<213> Artificial Sequence

Sequence Listing

<220>
<223> IFN-omega: 27th, 36th, 38th, 65th, 68th, 124th or 153rd Phe is replaced by Val.

<400> 11

```
Cys Asp Leu Pro Gln Asn His Gly Leu Leu Ser Arg Asn Thr Leu Val
 1               5                  10                  15

Leu Leu His Gln Met Arg Arg Ile Ser Pro Phe Leu Cys Leu Lys Asp
            20                  25                  30

Arg Arg Asp Phe Arg Phe Pro Gln Glu Met Val Lys Gly Ser Gln Leu
        35                  40                  45

Gln Lys Ala His Val Met Ser Val Leu His Glu Met Leu Gln Gln Ile
    50                  55                  60

Phe Ser Leu Phe His Thr Glu Arg Ser Ser Ala Ala Trp Asn Met Thr
65                  70                  75                  80

Leu Leu Asp Gln Leu His Thr Gly Leu His Gln Gln Leu Gln His Leu
                85                  90                  95

Glu Thr Cys Leu Leu Gln Val Val Gly Glu Gly Glu Ser Ala Gly Ala
            100                 105                 110

Ile Ser Ser Pro Ala Leu Thr Leu Arg Arg Tyr Phe Gln Gly Ile Arg
        115                 120                 125

Val Tyr Leu Lys Glu Lys Lys Tyr Ser Asp Cys Ala Trp Glu Val Val
    130                 135                 140

Arg Met Glu Ile Met Lys Ser Leu Phe Leu Ser Thr Asn Met Gln Glu
145                 150                 155                 160

Arg Leu Arg Ser Lys Asp Arg Asp Leu Gly Ser Ser
                165                 170
```

Sequence Listing

<210> 12
<211> 187
<212> PRT
<213> Artificial Sequence

<220>
<223> IFN-tau: 8th, 39th, 68th, 71st, 88th, 127th, 156th, 157th, 159th or 183rd Phe is replaced by Val.

<400> 12

```
Leu Asp Leu Lys Leu Ile Ile Phe Gln Gln Arg Gln Val Asn Gln Glu
 1               5                  10                  15

Ser Leu Lys Leu Leu Asn Lys Leu Gln Thr Leu Ser Ile Gln Gln Cys
            20                  25                  30

Leu Pro His Arg Lys Asn Phe Leu Leu Pro Gln Lys Ser Leu Ser Pro
        35                  40                  45

Gln Gln Tyr Gln Lys Gly His Thr Leu Ala Ile Leu His Glu Met Leu
    50                  55                  60

Gln Gln Ile Phe Ser Leu Phe Arg Ala Asn Ile Ser Leu Asp Gly Trp
65                  70                  75                  80

Glu Glu Asn His Thr Glu Lys Phe Leu Ile Gln Leu His Gln Gln Leu
                85                  90                  95

Glu Tyr Leu Glu Ala Leu Met Gly Leu Glu Ala Glu Lys Leu Ser Gly
            100                 105                 110

Thr Leu Gly Ser Asp Asn Leu Arg Leu Gln Val Lys Met Tyr Phe Arg
        115                 120                 125

Arg Ile His Asp Tyr Leu Glu Asn Gln Asp Tyr Ser Thr Cys Ala Trp
    130                 135                 140

Ala Ile Val Gln Val Glu Ile Ser Arg Cys Leu Phe Phe Val Phe Ser
```

145 150 155 160

Leu Thr Glu Lys Leu Ser Lys Gln Gly Arg Pro Leu Asn Asp Met Lys
165 170 175

Gln Glu Leu Thr Thr Glu Phe Arg Ser Pro Arg
180 185

<210> 13
<211> 133
<212> PRT
<213> Artificial Sequence

<220>
<223> IL-2: 42nd, 44th, 78th, 103rd, 117th or 124th Phe is replaced by Val.

<400> 13
Ala Pro Thr Ser Ser Ser Thr Lys Lys Thr Gln Leu Gln Leu Glu His
1 5 10 15

Leu Leu Leu Asp Leu Gln Met Ile Leu Asn Gly Ile Asn Asn Tyr Lys
20 25 30

Asn Pro Lys Leu Thr Arg Met Leu Thr Phe Lys Phe Tyr Met Pro Lys
35 40 45

Lys Ala Thr Glu Leu Lys His Leu Gln Cys Leu Glu Glu Glu Leu Lys
50 55 60

Pro Leu Glu Glu Val Leu Asn Leu Ala Gln Ser Lys Asn Phe His Leu
65 70 75 80

Arg Pro Arg Asp Leu Ile Ser Asn Ile Asn Val Ile Val Leu Glu Leu
85 90 95

Lys Gly Ser Glu Thr Thr Phe Met Cys Glu Tyr Ala Asp Glu Thr Ala
100 105 110

Sequence Listing

Thr Ile Val Glu Phe Leu Asn Arg Trp Ile Thr Phe Cys Gln Ser Ile
115 120 125

Ile Ser Thr Leu Thr
130

<210> 14
<211> 133
<212> PRT
<213> Artificial Sequence

<220>
<223> IL-3: 37th, 61st, 107th, 113rd or 133rd Phe is replaced by Val.

<400> 14
Ala Pro Met Thr Gln Thr Thr Pro Leu Lys Thr Ser Trp Val Asn Cys
1 5 10 15

Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro Leu
20 25 30

Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile Leu
35 40 45

Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg Ala
50 55 60

Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys Asn
65 70 75 80

Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His Pro
85 90 95

Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr
100 105 110

Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln Thr Thr Leu

115 120 125

Ser Leu Ala Ile Phe
130

<210> 15
<211> 129
<212> PRT
<213> Artificial Sequence

<220>
<223> IL-4: 33rd, 45th, 55th, 73rd, 82nd or 112nd Phe is replaced by Val.

<400> 15
His Lys Cys Asp Ile Thr Leu Gln Glu Ile Ile Lys Thr Leu Asn Ser
1 5 10 15

Leu Thr Glu Gln Lys Thr Leu Cys Thr Glu Leu Thr Val Thr Asp Ile
20 25 30

Phe Ala Ala Ser Lys Asn Thr Thr Glu Lys Glu Thr Phe Cys Arg Ala
35 40 45

Ala Thr Val Leu Arg Gln Phe Tyr Ser His His Glu Lys Asp Thr Arg
50 55 60

Cys Leu Gly Ala Thr Ala Gln Gln Phe His Arg His Lys Gln Leu Ile
65 70 75 80

Arg Phe Leu Lys Arg Leu Asp Arg Asn Leu Trp Gly Leu Ala Gly Leu
85 90 95

Asn Ser Cys Pro Val Lys Glu Ala Asn Gln Ser Thr Leu Glu Asn Phe
100 105 110

Leu Glu Arg Leu Lys Thr Ile Met Arg Glu Lys Tyr Ser Lys Cys Ser
115 120 125

Sequence Listing

Ser

<210> 16
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> IL-5: 49th, 69th, 96th or 103rd Phe is replaced by Val.

<400> 16

```
Ile Pro Thr Glu Ile Pro Thr Ser Ala Leu Val Lys Glu Thr Leu Ala
 1               5                  10                  15

Leu Leu Ser Thr His Arg Thr Leu Leu Ile Ala Asn Glu Thr Leu Arg
            20                  25                  30

Ile Pro Val Pro Val His Lys Asn His Gln Leu Cys Thr Glu Glu Ile
        35                  40                  45

Phe Gln Gly Ile Gly Thr Leu Glu Ser Gln Thr Val Gln Gly Gly Thr
    50                  55                  60

Val Glu Arg Leu Phe Lys Asn Leu Ser Leu Ile Lys Lys Tyr Ile Asp
65                  70                  75                  80

Gly Gln Lys Lys Lys Cys Gly Glu Glu Arg Arg Arg Val Asn Gln Phe
                85                  90                  95

Leu Asp Tyr Leu Gln Glu Phe Leu Gly Val Met Asn Thr Glu Trp Ile
            100                 105                 110

Ile Glu Ser
        115
```

Sequence Listing

<210> 17
<211> 183
<212> PRT
<213> Artificial Sequence

<220>
<223> IL-6: 73rd, 77th, 93rd, 104th, 124th, 169th or 172nd Phe is replaced by Val.

<400> 17

```
Val Pro Pro Gly Glu Asp Ser Lys Asp Val Ala Ala Pro His Arg Gln
 1               5                  10                  15

Pro Leu Thr Ser Ser Glu Arg Ile Asp Lys Gln Ile Arg Tyr Ile Leu
            20                  25                  30

Asp Gly Ile Ser Ala Leu Arg Lys Glu Thr Cys Asn Lys Ser Asn Met
        35                  40                  45

Cys Glu Ser Ser Lys Glu Ala Leu Ala Glu Asn Asn Leu Asn Leu Pro
    50                  55                  60

Lys Met Ala Glu Lys Asp Gly Cys Phe Gln Ser Gly Phe Asn Glu Glu
65                  70                  75                  80

Thr Cys Leu Val Lys Ile Ile Thr Gly Leu Leu Glu Phe Glu Val Tyr
                85                  90                  95

Leu Glu Tyr Leu Gln Asn Arg Phe Glu Ser Ser Glu Glu Gln Ala Arg
            100                 105                 110

Ala Val Gln Met Ser Thr Lys Val Leu Ile Gln Phe Leu Gln Lys Lys
        115                 120                 125

Ala Lys Asn Leu Asp Ala Ile Thr Thr Pro Asp Pro Thr Thr Asn Ala
    130                 135                 140

Ser Leu Leu Thr Lys Leu Gln Ala Gln Asn Gln Trp Leu Gln Asp Met
145                 150                 155                 160
```

Sequence Listing

```
Thr Thr His Leu Ile Leu Arg Ser Phe Lys Glu Phe Leu Gln Ser Ser
                165                 170                 175

Leu Arg Ala Leu Arg Gln Met
            180
```

<210> 18
<211> 197
<212> PRT
<213> Artificial Sequence

<220>
<223> IL-12p35: 13rd, 39th, 82nd, 96th, 116th, 132nd, 150th, 166th or 180th Phe is replaced by Val.

<400> 18

```
Arg Asn Leu Pro Val Ala Thr Pro Asp Pro Gly Met Phe Pro Cys Leu
  1               5                  10                  15

His His Ser Gln Asn Leu Leu Arg Ala Val Ser Asn Met Leu Gln Lys
             20                  25                  30

Ala Arg Gln Thr Leu Glu Phe Tyr Pro Cys Thr Ser Glu Glu Ile Asp
         35                  40                  45

His Glu Asp Ile Thr Lys Asp Lys Thr Ser Thr Val Glu Ala Cys Leu
     50                  55                  60

Pro Leu Glu Leu Thr Lys Asn Glu Ser Cys Leu Asn Ser Arg Glu Thr
 65                  70                  75                  80

Ser Phe Ile Thr Asn Gly Ser Cys Leu Ala Ser Arg Lys Thr Ser Phe
                 85                  90                  95

Met Met Ala Leu Cys Leu Ser Ser Ile Tyr Glu Asp Leu Lys Met Tyr
            100                 105                 110
```

Sequence Listing

```
Gln Val Glu Phe Lys Thr Met Asn Ala Lys Leu Leu Met Asp Pro Lys
        115                 120                 125

Arg Gln Ile Phe Leu Asp Gln Asn Met Leu Ala Val Ile Asp Glu Leu
    130                 135                 140

Met Gln Ala Leu Asn Phe Asn Ser Glu Thr Val Pro Gln Lys Ser Ser
145                 150                 155                 160

Leu Glu Glu Pro Asp Phe Tyr Lys Thr Lys Ile Lys Leu Cys Ile Leu
                165                 170                 175

Leu His Ala Phe Arg Ile Arg Ala Val Thr Ile Asp Arg Val Met Ser
            180                 185                 190

Tyr Leu Asn Ala Ser
        195
```

<210> 19
<211> 146
<212> PRT
<213> Artificial Sequence

<220>
<223> LPT: 41st or 92nd Phe is replaced by Val.

<400> 19

```
Val Pro Ile Gln Lys Val Gln Asp Asp Thr Lys Thr Leu Ile Lys Thr
  1               5                  10                  15

Ile Val Thr Arg Ile Asn Asp Ile Ser His Thr Gln Ser Val Ser Ser
             20                  25                  30

Lys Gln Lys Val Thr Gly Leu Asp Phe Ile Pro Gly Leu His Pro Ile
         35                  40                  45

Leu Thr Leu Ser Lys Met Asp Gln Thr Leu Ala Val Tyr Gln Gln Ile
     50                  55                  60
```

```
Leu Thr Ser Met Pro Ser Arg Asn Val Ile Gln Ile Ser Asn Asp Leu
 65                  70                  75                  80

Glu Asn Leu Arg Asp Leu Leu His Val Leu Ala Phe Ser Lys Ser Cys
                 85                  90                  95

His Leu Pro Trp Ala Ser Gly Leu Glu Thr Leu Asp Ser Leu Gly Gly
            100                 105                 110

Val Leu Glu Ala Ser Gly Tyr Ser Thr Glu Val Val Ala Leu Ser Arg
        115                 120                 125

Leu Gln Gly Ser Leu Gln Asp Met Leu Trp Gln Leu Asp Leu Ser Pro
    130                 135                 140

Gly Cys
145
```

<210> 20
<211> 180
<212> PRT
<213> Artificial Sequence

<220>
<223> LIF: 41st, 52nd, 67th, 70th, 156th or 180th Phe is replaced by Val.

<400> 20

```
Ser Pro Leu Pro Ile Thr Pro Val Asn Ala Thr Cys Ala Ile Arg His
  1               5                  10                  15

Pro Cys His Asn Asn Leu Met Asn Gln Ile Arg Ser Gln Leu Ala Gln
             20                  25                  30

Leu Asn Gly Ser Ala Asn Ala Leu Phe Ile Leu Tyr Tyr Thr Ala Gln
         35                  40                  45
```

Sequence Listing

```
Gly Glu Pro Phe Pro Asn Asn Leu Asp Lys Leu Cys Gly Pro Asn Val
     50                  55                  60

Thr Asp Phe Pro Pro Phe His Ala Asn Gly Thr Glu Lys Ala Lys Leu
 65                  70                  75                  80

Val Glu Leu Tyr Arg Ile Val Val Tyr Leu Gly Thr Ser Leu Gly Asn
                 85                  90                  95

Ile Thr Arg Asp Gln Lys Ile Leu Asn Pro Ser Ala Leu Ser Leu His
            100                 105                 110

Ser Lys Leu Asn Ala Thr Ala Asp Ile Leu Arg Gly Leu Leu Ser Asn
        115                 120                 125

Val Leu Cys Arg Leu Cys Ser Lys Tyr His Val Gly His Val Asp Val
    130                 135                 140

Thr Tyr Gly Pro Asp Thr Ser Gly Lys Asp Val Phe Gln Lys Lys Lys
145                 150                 155                 160

Leu Gly Cys Gln Leu Leu Gly Lys Tyr Lys Gln Ile Ile Ala Val Leu
                165                 170                 175

Ala Gln Ala Phe
            180
```

<210> 21
<211> 522
<212> PRT
<213> Artificial Sequence

<220>
<223> M-CSF: 35th, 37th, 54th, 67th, 91st, 106th, 121st, 135th, 143rd, 229th, 255th, 311st, 439th, 466th or 485th Phe is replaced by Val.

<400> 21

Sequence Listing

```
Glu Glu Val Ser Glu Tyr Cys Ser His Met Ile Gly Ser Gly His Leu
  1               5                  10                  15

Gln Ser Leu Gln Arg Leu Ile Asp Ser Gln Met Glu Thr Ser Cys Gln
             20                  25                  30

Ile Thr Phe Glu Phe Val Asp Gln Glu Gln Leu Lys Asp Pro Val Cys
         35                  40                  45

Tyr Leu Lys Lys Ala Phe Leu Leu Val Gln Asp Ile Met Glu Asp Thr
     50                  55                  60

Met Arg Phe Arg Asp Asn Thr Pro Asn Ala Ile Ala Ile Val Gln Leu
 65                  70                  75                  80

Gln Glu Leu Ser Leu Arg Leu Lys Ser Cys Phe Thr Lys Asp Tyr Glu
                 85                  90                  95

Glu His Asp Lys Ala Cys Val Arg Thr Phe Tyr Glu Thr Pro Leu Gln
            100                 105                 110

Leu Leu Glu Lys Val Lys Asn Val Phe Asn Glu Thr Lys Asn Leu Leu
        115                 120                 125

Asp Lys Asp Trp Asn Ile Phe Ser Lys Asn Cys Asn Asn Ser Phe Ala
    130                 135                 140

Glu Cys Ser Ser Gln Asp Val Val Thr Lys Pro Asp Cys Asn Cys Leu
145                 150                 155                 160

Tyr Pro Lys Ala Ile Pro Ser Ser Asp Pro Ala Ser Val Ser Pro His
                165                 170                 175

Gln Pro Leu Ala Pro Ser Met Ala Pro Val Ala Gly Leu Thr Trp Glu
            180                 185                 190

Asp Ser Glu Gly Thr Glu Gly Ser Ser Leu Leu Pro Gly Glu Gln Pro
        195                 200                 205

Leu His Thr Val Asp Pro Gly Ser Ala Lys Gln Arg Pro Pro Arg Ser
```

```
    210                 215                 220

Thr Cys Gln Ser Phe Glu Pro Pro Glu Thr Pro Val Val Lys Asp Ser
225                 230                 235                 240

Thr Ile Gly Gly Ser Pro Gln Pro Arg Pro Ser Val Gly Ala Phe Asn
                245                 250                 255

Pro Gly Met Glu Asp Ile Leu Asp Ser Ala Met Gly Thr Asn Trp Val
            260                 265                 270

Pro Glu Glu Ala Ser Gly Glu Ala Ser Glu Ile Pro Val Pro Gln Gly
        275                 280                 285

Thr Glu Leu Ser Pro Ser Arg Pro Gly Gly Gly Ser Met Gln Thr Glu
    290                 295                 300

Pro Ala Arg Pro Ser Asn Phe Leu Ser Ala Ser Ser Pro Leu Pro Ala
305                 310                 315                 320

Ser Ala Lys Gly Gln Gln Pro Ala Asp Val Thr Gly Thr Ala Leu Pro
                325                 330                 335

Arg Val Gly Pro Val Arg Pro Thr Gly Gln Asp Trp Asn His Thr Pro
            340                 345                 350

Gln Lys Thr Asp His Pro Ser Ala Leu Leu Arg Asp Pro Pro Glu Pro
        355                 360                 365

Gly Ser Pro Arg Ile Ser Ser Leu Arg Pro Gln Gly Leu Ser Asn Pro
    370                 375                 380

Ser Thr Leu Ser Ala Gln Pro Gln Leu Ser Arg Ser His Ser Ser Gly
385                 390                 395                 400

Ser Val Leu Pro Leu Gly Glu Leu Glu Gly Arg Arg Ser Thr Arg Asp
                405                 410                 415

Arg Arg Ser Pro Ala Glu Pro Glu Gly Gly Pro Ala Ser Glu Gly Ala
            420                 425                 430
```

Sequence Listing

```
Ala Arg Pro Leu Pro Arg Phe Asn Ser Val Pro Leu Thr Asp Thr Gly
        435                 440                 445

His Glu Arg Gln Ser Glu Gly Ser Ser Ser Pro Gln Leu Gln Glu Ser
    450                 455                 460

Val Phe His Leu Leu Val Pro Ser Val Ile Leu Val Leu Leu Ala Val
465                 470                 475                 480

Gly Gly Leu Leu Phe Tyr Arg Trp Arg Arg Arg Ser His Gln Glu Pro
                485                 490                 495

Gln Arg Ala Asp Ser Pro Leu Glu Gln Pro Glu Gly Ser Pro Leu Thr
            500                 505                 510

Gln Asp Asp Arg Gln Val Glu Leu Pro Val
        515                 520
```

<210> 22
<211> 227
<212> PRT
<213> Artificial Sequence

<220>
<223> OSM: 56th, 70th, 160th, 169th, 176th or 184th Phe is replaced by Val.

<400> 22

```
Ala Ala Ile Gly Ser Cys Ser Lys Glu Tyr Arg Val Leu Leu Gly Gln
  1               5                  10                  15

Leu Gln Lys Gln Thr Asp Leu Met Gln Asp Thr Ser Arg Leu Leu Asp
            20                  25                  30

Pro Tyr Ile Arg Ile Gln Gly Leu Asp Val Pro Lys Leu Arg Glu His
        35                  40                  45
```

Sequence Listing

```
Cys Arg Glu Arg Pro Gly Ala Phe Pro Ser Glu Glu Thr Leu Arg Gly
     50                  55                  60

Leu Gly Arg Arg Gly Phe Leu Gln Thr Leu Asn Ala Thr Leu Gly Cys
 65                  70                  75                  80

Val Leu His Arg Leu Ala Asp Leu Glu Gln Arg Leu Pro Lys Ala Gln
                 85                  90                  95

Asp Leu Glu Arg Ser Gly Leu Asn Ile Glu Asp Leu Glu Lys Leu Gln
            100                 105                 110

Met Ala Arg Pro Asn Ile Leu Gly Leu Arg Asn Asn Ile Tyr Cys Met
        115                 120                 125

Ala Gln Leu Leu Asp Asn Ser Asp Thr Ala Glu Pro Thr Lys Ala Gly
    130                 135                 140

Arg Gly Ala Ser Gln Pro Pro Thr Pro Thr Pro Ala Ser Asp Ala Phe
145                 150                 155                 160

Gln Arg Lys Leu Glu Gly Cys Arg Phe Leu His Gly Tyr His Arg Phe
                165                 170                 175

Met His Ser Val Gly Arg Val Phe Ser Lys Trp Gly Glu Ser Pro Asn
            180                 185                 190

Arg Ser Arg Arg His Ser Pro His Gln Ala Leu Arg Lys Gly Val Arg
        195                 200                 205

Arg Thr Arg Pro Ser Arg Lys Gly Lys Arg Leu Met Thr Arg Gly Gln
    210                 215                 220

Leu Pro Arg
225
```

<210> 23
<211> 191
<212> PRT

Sequence Listing

<213> Artificial Sequence

<220>

<223> PL: 10th, 31st, 44th, 52nd, 54th, 92nd, 97th, 146th, 166th, 176th or 191st Phe is replaced by Val.

<400> 23

```
Val Gln Thr Val Pro Leu Ser Arg Leu Phe Asp His Ala Met Leu Gln
 1               5                  10                  15

Ala His Arg Ala His Gln Leu Ala Ile Asp Thr Tyr Gln Glu Phe Glu
            20                  25                  30

Glu Thr Tyr Ile Pro Lys Asp Gln Lys Tyr Ser Phe Leu His Asp Ser
        35                  40                  45

Gln Thr Ser Phe Cys Phe Ser Asp Ser Ile Pro Thr Pro Ser Asn Met
    50                  55                  60

Glu Glu Thr Gln Gln Lys Ser Asn Leu Glu Leu Leu Arg Ile Ser Leu
65                  70                  75                  80

Leu Leu Ile Glu Ser Trp Leu Glu Pro Val Arg Phe Leu Arg Ser Met
                85                  90                  95

Phe Ala Asn Asn Leu Val Tyr Asp Thr Ser Asp Ser Asp Asp Tyr His
            100                 105                 110

Leu Leu Lys Asp Leu Glu Glu Gly Ile Gln Thr Leu Met Gly Arg Leu
        115                 120                 125

Glu Asp Gly Ser Arg Arg Thr Gly Gln Ile Leu Lys Gln Thr Tyr Ser
    130                 135                 140

Lys Phe Asp Thr Asn Ser His Asn His Asp Ala Leu Leu Lys Asn Tyr
145                 150                 155                 160

Gly Leu Leu Tyr Cys Phe Arg Lys Asp Met Asp Lys Val Glu Thr Phe
                165                 170                 175
```

```
Leu Arg Met Val Gln Cys Arg Ser Val Glu Gly Ser Cys Gly Phe
            180                 185                 190
```

<210> 24
<211> 248
<212> PRT
<213> Artificial Sequence

<220>
<223> SCF: 63rd, 102nd, 110th, 115th, 116th, 119th, 126th, 129th, 158th, 199th, 205th, 207th or 245th Phe is replaced by Val.

<400> 24

```
Glu Gly Ile Cys Arg Asn Arg Val Thr Asn Asn Val Lys Asp Val Thr
  1               5                  10                  15

Lys Leu Val Ala Asn Leu Pro Lys Asp Tyr Met Ile Thr Leu Lys Tyr
             20                  25                  30

Val Pro Gly Met Asp Val Leu Pro Ser His Cys Trp Ile Ser Glu Met
         35                  40                  45

Val Val Gln Leu Ser Asp Ser Leu Thr Asp Leu Leu Asp Lys Phe Ser
     50                  55                  60

Asn Ile Ser Glu Gly Leu Ser Asn Tyr Ser Ile Ile Asp Lys Leu Val
 65                  70                  75                  80

Asn Ile Val Asp Asp Leu Val Glu Cys Val Lys Glu Asn Ser Ser Lys
                 85                  90                  95

Asp Leu Lys Lys Ser Phe Lys Ser Pro Glu Pro Arg Leu Phe Thr Pro
            100                 105                 110

Glu Glu Phe Phe Arg Ile Phe Asn Arg Ser Ile Asp Ala Phe Lys Asp
```

115 120 125

Phe Val Val Ala Ser Glu Thr Ser Asp Cys Val Val Ser Ser Thr Leu
130 135 140

Ser Pro Glu Lys Asp Ser Arg Val Ser Val Thr Lys Pro Phe Met Leu
145 150 155 160

Pro Pro Val Ala Ala Ser Ser Leu Arg Asn Asp Ser Ser Ser Ser Asn
165 170 175

Arg Lys Ala Lys Asn Pro Pro Gly Asp Ser Ser Leu His Trp Ala Ala
180 185 190

Met Ala Leu Pro Ala Leu Phe Ser Leu Ile Ile Gly Phe Ala Phe Gly
195 200 205

Ala Leu Tyr Trp Lys Lys Arg Gln Pro Ser Leu Thr Arg Ala Val Glu
210 215 220

Asn Ile Gln Ile Asn Glu Glu Asp Asn Glu Ile Ser Met Leu Gln Glu
225 230 235 240

Lys Glu Arg Glu Phe Gln Glu Val
245

<210> 25
<211> 332
<212> PRT
<213> Artificial Sequence

<220>
<223> TPO: 46th, 128th, 131st, 141st, 186th, 204th, 240th or 286th Phe is replaced by Val.

<400> 25
Ser Pro Ala Pro Pro Ala Cys Asp Leu Arg Val Leu Ser Lys Leu Leu
1 5 10 15

Sequence Listing

```
Arg Asp Ser His Val Leu His Ser Arg Leu Ser Gln Cys Pro Glu Val
             20                  25                  30

His Pro Leu Pro Thr Pro Val Leu Leu Pro Ala Val Asp Phe Ser Leu
         35                  40                  45

Gly Glu Trp Lys Thr Gln Met Glu Glu Thr Lys Ala Gln Asp Ile Leu
     50                  55                  60

Gly Ala Val Thr Leu Leu Leu Glu Gly Val Met Ala Ala Arg Gly Gln
 65                  70                  75                  80

Leu Gly Pro Thr Cys Leu Ser Ser Leu Leu Gly Gln Leu Ser Gly Gln
                85                  90                  95

Val Arg Leu Leu Leu Gly Ala Leu Gln Ser Leu Leu Gly Thr Gln Leu
            100                 105                 110

Pro Pro Gln Gly Arg Thr Thr Ala His Lys Asp Pro Asn Ala Ile Phe
        115                 120                 125

Leu Ser Phe Gln His Leu Leu Arg Gly Lys Val Arg Phe Leu Met Leu
    130                 135                 140

Val Gly Gly Ser Thr Leu Cys Val Arg Arg Ala Pro Pro Thr Thr Ala
145                 150                 155                 160

Val Pro Ser Arg Thr Ser Leu Val Leu Thr Leu Asn Glu Leu Pro Asn
                165                 170                 175

Arg Thr Ser Gly Leu Leu Glu Thr Asn Phe Thr Ala Ser Ala Arg Thr
            180                 185                 190

Thr Gly Ser Gly Leu Leu Lys Trp Gln Gln Gly Phe Arg Ala Lys Ile
        195                 200                 205

Pro Gly Leu Leu Asn Gln Thr Ser Arg Ser Leu Asp Gln Ile Pro Gly
    210                 215                 220
```

```
Tyr Leu Asn Arg Ile His Glu Leu Leu Asn Gly Thr Arg Gly Leu Phe
225                 230                 235                 240

Pro Gly Pro Ser Arg Arg Thr Leu Gly Ala Pro Asp Ile Ser Ser Gly
                245                 250                 255

Thr Ser Asp Thr Gly Ser Leu Pro Pro Asn Leu Gln Pro Gly Tyr Ser
            260                 265                 270

Pro Ser Pro Thr His Pro Pro Thr Gly Gln Tyr Thr Leu Phe Pro Leu
        275                 280                 285

Pro Pro Thr Leu Pro Thr Pro Val Val Gln Leu His Pro Leu Leu Pro
    290                 295                 300

Asp Pro Ser Ala Pro Thr Pro Thr Pro Thr Ser Pro Leu Leu Asn Thr
305                 310                 315                 320

Ser Tyr Thr His Ser Gln Asn Leu Ser Gln Glu Gly
                325                 330
```

<210> 26
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 1

<400> 26
cggaattccg atggagctga ctgaattg 28

<210> 27
<211> 30
<212> DNA
<213> Artificial Sequence

Sequence Listing

<220>
<223> primer 2

<400> 27
tttagcggcc gcattcttac ccttcctgag 30

<210> 28
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 4

<400> 28
ccaagctaac gtccacagca g 21

<210> 29
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 6

<400> 29
gctcaggacg atggcat 17

<210> 30
<211> 23
<212> DNA
<213> Artificial Sequence

<220>

<223> primer 8

<400> 30
ggtgttggac gctcaggaag atg 23

<210> 31
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 10

<400> 31
catcaggaca cgcacctttc c 21

<210> 32
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 11

<400> 32
ggcgcggaga tgggggt 17

<210> 33
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 12

Sequence Listing

<400> 33
tggtcatctg tcccctgtcc tg 22

<210> 34
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 14

<400> 34
gacattaact ttggtgtctg ggac 24

<210> 35
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 15

<400> 35
ctgtccgcaa actcttccga g 21

<210> 36
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 17

Sequence Listing

<400> 36
cgcaaactcg tccgagtcta ct 22

<210> 37
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 19

<400> 37
gagtctactc caatgtggtg gg 22

<210> 38
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 21

<400> 38
ccccgggacc atggctggac ctgccaccca g 31

<210> 39
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 22

Sequence Listing

<400> 39
cgaattcgct cagggctggg caaggag 27

<210> 40
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 24

<400> 40
acttgagcag gacgctct 18

<210> 41
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 25

<400> 41
agcggccttg tcctcta 17

<210> 42
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 27

<400> 42

gacgttgcca ccaccat 17

<210> 43
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 29

<400> 43
gccgtcgcct ctgcttt 17

<210> 44
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 31

<400> 44
tcgccttctg ctgtccag 18

<210> 45
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 33

<400> 45
tctgcaagac gtcctgg 17

Sequence Listing

<210> 46
<211> 64
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 35

<400> 46
cttttggcct gctctgcctg tcctggcttc aagagggcag tgccttccca accattccct 60

tatc 64

<210> 47
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 37

<400> 47
ggaattcatg gctgcaggct cccggacgtc cctgctcctg gcttttggcc tgctctgcct 60

60

<210> 48
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 40

Sequence Listing

<400> 48
ggggttctgc aggactgaat acttc 25

<210> 49
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 42

<400> 49
ggctgttggc gacgatcctg 20

<210> 50
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 44

<400> 50
gtaggtctgc ttgacgatct gcccag 26

<210> 51
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 46

Sequence Listing

<400> 51
gagtttgtgt cgaccttgct gtag 24

<210> 52
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 48

<400> 52
gtccttcctg acgcagtaga gcag 24

<210> 53
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 50

<400> 53
cgatgcgcag gactgtctcg accttgtc 28

<210> 54
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 51

<400> 54

cggaattcat ggaccacctc ggggcg 26

<210> 55
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 52

<400> 55
gctctagact aagagcaagc cacatagctg gg 32

<210> 56
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 53

<400> 56
cccaagctta tggagctgac tgaattgctc ctc 33

<210> 57
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 54

<400> 57
ggaattctta cccttcctga gacagattct gg 32

Sequence Listing

<210> 58
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 55

<400> 58
gctctagagc tcatttaccc ggagacaggg agag 34

<210> 59
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 56

<400> 59
cccaagctta tggctggacc tgccaccc 28

<210> 60
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 57

<400> 60
ggaattcgca acagagccag gcagttcca 29

Sequence Listing

<210> 61
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 58

<400> 61
cggaattcat ggatctctgg cagctg 26

<210> 62
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 59

<400> 62
ggactagttt ggctcatctg aggaagtg 28

<210> 63
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 60

<400> 63
ggaattcgca gagcccaaat cttgtgacaa aactc 35

Sequence Listing

<210> 64
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 61

<400> 64
gactagtgca gagcccaaat cttgtga 27

<210> 65
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> primer 62

<400> 65
gctctagagc tcatttaccc ggagacaggg agag 34